CENTER FOR INSTITUTIONAL REFORM AND THE INFORMAL SECTOR

University of Maryland at College Park

Center Office: IRIS Center, 2105 Morrill Hall, College Park, MD 20742
Telephone (301) 405-3110 • Fax (301) 405-3020

A TALE OF TWO SECTORS: THE FORMAL AND INFORMAL SECTORS IN INDIA

1992

Pradeep Srivastava and Urjit R. Patel
Working Paper No. 26

This publication was made possible through support provided by the U.S. Agency for International Development, under Cooperative Agreement No. DHR-0015-A-00-0031-00.

Author: Pradeep Srivastava and Urjit R. Patel, University of Maryland at College Park

A TALE OF TWO SECTORS:
THE FORMAL AND INFORMAL SECTORS IN INDIA

December 1991

Urjit R. Patel
International Monetary Fund
Washington, D.C. 20431

Pradeep Srivastava
HIID, Harvard University
One Eliot Street
Cambridge, M.A. 02138

Abstract

This paper presents an aggregative analysis of the informal sector in India. The hitherto ignored informal sector in developing societies is increasingly acquiring a central role in new thinking about development strategies. The study investigates the underlying data generating processes in terms of common stochastic trends using a macroeconometric framework related to real business cycle theory. Under appropriate assumptions regarding aggregation, the paper analyses the behaviour of the formal and informal sectors in India in terms of their intrinsic conditional distribution properties as well as the relationships of their data generating mechanisms with respect to each other and several government related policy variables. In addition to highlighting the distinctively different characteristics of the informal sector, the results obtained have important policy implications for developing economies. The results also raise serious questions about abstracting from institutional aspects of development.

A TALE OF TWO SECTORS:
THE FORMAL AND INFORMAL SECTORS IN INDIA

"There is no such thing as the informal sector".

"If at all it exists, it is no different from the formal sector".

This paper presents an aggregative analysis of the informal sector in India. Although enjoying wide currency amongst other social sciences, and, within economics, in the context of development and urban planning in poor countries, the informal sector for the most part has had a rather marginal presence within neoclassical economics in general. For various reasons, the perceptions towards economic activities constituting the informal sector have been essentially of benign neglect in terms of both theory and empirical investigation. A revealing example of this attitude is provided by the following quote:

> "Year after year the Annual Report of the Uganda Protectorate has referred, under the heading of industry, to a few large undertakings directly sponsored by the Government. At the same time the multifarious development of furniture workshops, soap mills, tire retreading plants, bakeries and brickfields has gone largely unnoticed. An official who was once asked about Kampala's industrial area said: "There are no industries there - only a lot of furniture works, bakeries, maize mills and soda water factories"."[1]

---

1. From Elkan(1959), quoted in Peattie(1987).

Although views have altered substantially since then, it is still true that almost no developing country (with the exception of India) has routinely collected data pertaining specifically to the economic activities in the informal sector. In terms of theoretical analysis too, the most prevalent notion is that the formal-informal sector dichotomy is of little concern or interest.[2] The analysis in this paper takes this as its guiding hypothesis and proceeds to test it in different ways using aggregate data on the formal and informal sectors in India.

Given the inadequate theorizing on the informal sector, we eschew structural modeling in favor of a theoretical framework based upon the recent literature on real business cycles. The theoretical structure underlying a wide class of models of real business cycles abstracts from institutional aspects and focuses instead on the role of economy-wide permanent productivity shocks combined with appropriate restrictions on preferences and technological possibilities that generate stylized steady-state behavior of the economy. A natural implication of this framework is the existence of cointegrated relationships among specific variables in the economy. In the analysis presented here, we use the null hypothesis that economic activities in the formal and informal sector represent outcomes of some basic model with common parameters. Consequently, the two sectors are manifestations of different drawings from the same underlying conditional distribution or data generating mechanism. Under suitable assumptions about the aggregation problem, this

---

2. A major exception is the large literature on the microeconomic analysis of rural credit markets in poor economies. Many of these studies make forcefully clear the emergence of non-standard results when analyzing these markets. See Bardhan(1989) for useful surveys and extensive references.

hypothesis implies presence of common stochastic trends for the data generating process of the formal- and informal-sector outputs.

The role of the state in the development process has always been of major significance and thus should not be ignored in the context of developing economies. Therefore, within our framework, we focus on the government's total expenditure in the economy as a major determinant of productivity shocks for developing economies in terms of, for example, provision of human and physical capital infrastructure, technology import and dissemination, etc.. We also incorporate in our analysis the relationship of outputs to monetary variables, namely, currency and the broader aggregate M1 (currency and deposits). The results lead to a rejection of the null hypothesis since the behavior at an aggregate level of the formal and informal sectors is significantly asymmetric when evaluated individually, in terms of their relationship to one another and in terms of the behavior with respect to variables incorporating the government. Finally, our results also cast considerable doubt on the relevance of much of the research in real business cycle theory to non-industrialized economies. In particular, the basic concept of 'business cycles' needs to be modified to be applicable in a broader context than the OECD economies.

The outline of the paper is as follows. Since the informal sector may not be widely familiar, in the next section we briefly discuss the notion of informal sector and document the importance of the sector in India. Some aspects of the methodology adopted in this paper can be related to Koopmans(1947) insightful arguments on the importance of theory for empirical analyses. Consequently, section III presents the motivation and the theoretical background for the empirical analysis in this paper as well as a

brief discussion of some methodological issues. The empirical results are provided in the three following sections. Results pertaining to the order of integration of the variables used are presented in section IV. Section V deals with the analysis of inter- and intra-sectoral relationships of the two sectors. Results about the relationship of the formal and informal sectors to government-related variables are presented in section VI. Some concluding remarks are contained in section VII of the paper. All tables and figures are at the end of the paper.

II The informal sector and its quantitative dimensions in India

Since the well-known ILO(1972) study in Kenya, the informal sector has acquired increasing prominence among practitioners in economic development. The sector often occupies almost a center stage in policy discussions of unemployment and poverty in the urban areas of poor countries. Yet it is also true that there have been relatively few analytical contributions in this area. A major reason underlying this revealed indifference is considerable ambiguity in defining what the informal sector is.[3] This is not to suggest that definitions of the informal sector have been lacking. Indeed the problem is quite the reverse; the informal sector has been defined in so many ways, as evidenced by the plethora of its synonyms, that the term has lost conceptual acuity - much like the way a person wearing more than one watch at a time can never be sure of the exact time.

The conceptual ambiguity of the informal sector is, to a certain extent, quite understandable. The concept of "informality" is intimately related to

---

3. Another reason is suggested by one of the popular synonyms of the informal sector, namely, the 'invisible' sector.

the "dualism" of the colonial societies discussed almost four decades ago by Boeke(1953). The dualism referred to an economy and a society divided between the traditional and modern capitalist sectors.[4] It is important to emphasize that dualism is as much a social phenomenon as an economic one; without doubt economic needs are fundamental to social relations but, outside the anonymous transacting environment of atomistic agents in well-developed markets, social relations are equally fundamental to the way economic activity is organized. In general, therefore, most definitions of the informal sector have tended to be diectic and broad, using terms like traditional, small, 'a way of doing things', etc., which do not have very obvious analytical counterparts in the optimization framework of neoclassical models. On the other hand, the limited attempts at more analytical conceptualization of the informal sector have only served to highlight what seems to be an intransigent trade-off between conceptual relevance and analytical formalism, or equivalently, between being approximately correct and precisely wrong. Within the domain of neoclassical theorizing, one can distinguish two approaches to the formalization of the informal sector in dual economies.

The first attempt was Lewis' (1954) seminal study which incorporated this dualism in terms of two coexisting production sectors that differ in organizational rules only.[5] The conceptually diffused notion of organizational dualism was provided analytical content by the defining of a traditional sector characterized by wage rates set by "conventional norms"

---

4. This dualism has analogues in Marxist literature in terms of "uneven development" and "center- periphery" which are outside the scope of this discussion. See Peattie(1987).

5. See Ranis and Fei(1982) for a more comprehensive discussion of Lewis' notion of dualism.

rather than the marginal product, and production decisions not based on profit maximization. Although Lewis clearly did not identify agriculture per se as the traditional sector, the notion of dualism emphasized analytically changed later from that of an organizational dualism to one of product asymmetry. The latter is easily adapted into the standard two-sector models of neoclassical economic theory wherein the product dualism is in terms of agriculture versus non-agricultural activities. Thus, the conceptually relevant but diffused notion of organizational dualism was effectively reduced to an analytically convenient two-sector model based upon a manufacturing and agricultural schism. Subsequent literature in this area focused considerable energy on the empirical and theoretical validity of the real wage assumption with little effort being put into seeking better ways to formalize the organizational dualism.

A more recent approach to the formal-informal distinction is in the context of financial dualism. Neo-structuralist models of van Wijnbergen(1983), Buffie(1984), and others have attempted to incorporate the informal credit markets that often constitute major parts of the aggregate financial sector. These models distinguish between the formal and informal credit markets through the assumption of regulated prices in the former while the informal credit markets are assumed to be characterized by unregulated and market-clearing prices. Substantively, the formal-informal distinction is indeed closely related to the state's regulatory machinery but reducing it to price regulation, although convenient analytically, is like throwing the baby out with the bath water. For example, consider the rental-housing market in New York: part of it is regulated and sold at subsidized prices, while there is also a coeval free market. The neo-structuralist formulations would

suggest that the market that is not regulated is the informal market whereas, in practice, it is if at all the market with regulated prices that actually works in an informal manner.[6]

For the purposes of our analysis here, therefore, we have chosen to opt for a somewhat broader, institutional definition of the informal sector, which also has the added benefit of conforming to the data that we utilize. The informal sector is hence defined in terms of economic activities that are organized and operated outside the penumbra of the state's judicial and administrative machinery.[7] In general, markets can be seen as one of many possible forms of organizing economic exchange; the usual market considered in economics rests upon certain implicit assumptions about the underlying institutional infrastructure, such as the existence of specific property rights, mechanisms for contract enforcement, etc.. The implication of the definition we have adopted is that the organization of economic activity in the informal sector is based upon institutions that are not provided by the state while the activities in the formal sector occur within the jurisdiction of the state's machinery.[8]

---

6. More generally, those familiar with the experience of trying to obtain rationed goods (including subsidized credit) in poor economies will recognize that this example is not specific to the context of an industrialized economy.

7. Note, however, that to the extent the hypothesis we are adopting is one that assumes the irrelevance of the formal-informal distinction, the importance of an exact specification of the informal sector is correspondingly diminished for the present purposes.

8. In the absence of state-provided institutional infrastructure, agents in the informal markets may devise or adapt other institutional mechanisms to reduce their costs of transacting. See Bardhan(1989) for numerous examples in this context.

This definition is also quite similar to the way the informal sector is defined by the government of India for purposes of its data collection. Since 1960, the government has published two separate output series, namely, the organized sector and the unorganized sector. The organized sector is defined essentially in terms of plantation agriculture, forestry and logging; public sector output such as electricity, gas and water supply, railways, communications, banking and insurance, public administration and defense; and, registered manufacturing and service sector activities, the latter including for example, construction, transport and storage. The remainder of the economy constitutes the informal sector.[9] It is worth noting that the estimates for the informal sector output are arrived at using independent sample surveys rather than as functions of the formal sector output.

An additional and important motivation for this work is provided by the relative importance, at various levels of aggregation, of the unorganized or informal sector in India's total output. Figures 1 and 2 are amply revealing in this respect (the figures cover data from 1960-61 to 1984-85). Though the share of total unorganized sector output (YU) in total output (Y) has fallen from 80% in 1951-52 (not shown in figure) to 62% in 1984-85, it is, needless to say, still substantial; as indicated by Figure 1, the total informal sector output (YU) is substantively higher than its formal sector counterpart (YO). The relative decline in the former is attributable primarily to the diminishing share of agriculture within the aggregate economy. In contrast, agriculture has a minimal role in the formal sector as illustrated by the small gap between the total and total non-agricultural formal sector outputs

9. Srivastava(1990) presents a more comprehensive discussion of the data on informal sector output.

(YO and YONA respectively) in Figure 1. However, the relative size of the informal sector has not changed in a substantive manner since 1960–61 as indicated by Figure 2 which shows the ratio of total informal sector output (YU) as a proportion of the total output (Y) at both the aggregate level and in terms of the non-agricultural activities in the economy. Thus, the share of informal sector non-agricultural output (YUNA) in total non-agricultural output (YNA) has changed only marginally from about 50% in 1951–52 (not shown) to about 45% in 1984–85. Further, the same ratio over the period 1963–64 to 1981–82 is virtually unchanged. In comparison, in terms of manufacturing sector alone, the share of the informal sector has declined somewhat more, from over 50% in 1960–61 to 37% in 1987–88 (not shown).[10] Thus, aside from the changes in the agricultural output, the informal sector does not show any major changes in relative terms and still constitutes a large part of the total economic activity in the country.

III Theoretical background and methodology

III.1 Motivation and theoretical background

Notwithstanding caveats at the purely theoretical level, the widespread use of aggregates in economic analysis indicates an implicit assumption that the aggregation problem does not in practice preclude a meaningful collapse of the heterogeneous agents in the economy into homogeneous representations; idiosyncratic deviations cancel out to an extent that is adequate for all practical purposes. An individual household or firm, thus, may show

---

10. Unlike the other series, the data on manufacturing output in the formal and informal sectors is available upto 1987–88. As discussed later, we attempt to allow for the changing role of agriculture by undertaking our analysis in terms of aggregate outputs as well as in terms of non-agricultural activities alone.

considerable disparities from the cumulative behavior but this dispersion can be eliminated by choosing units at adequate level of aggregation. In an analogous manner, the data generating process describing the total output of the economy may be quite distinct from that of an individual firm. However, the process for high levels of aggregation should approximate closely the cumulative data generating mechanism. Since both the formal and informal-sector outputs individually constitute large parts of the total output, and furthermore, are comprised of economic activities across all different sectors in the economy, we would expect their underlying processes to be broadly similar and homogeneous. A priori, if the formal-informal dichotomy is artificial, both series represent the optimal responses of representative firms in a homogeneous environment. In such a case we can presume there exist common parameters of some basic model and that the two sectors represent different drawings from the same underlying conditional distribution. Furthermore, even if the two series diverge at any point in time due to asymmetric innovations in their respective data generating processes, we would expect the behavior over time of the processes to be closely related to each other. If this does not hold, a natural conclusion is either that the agents are not representative (identical) or, more acceptably, that the environments are not the same. This motivates the first set of tests conducted in this analysis where we compare the behavior of informal and formal sector output series with respect to one another. The presumption here is that if the formal-informal dualism is without significance, there is no reason a priori to expect the two series to be de-coupled from one another.

The same null hypothesis informs the second set of tests we undertake wherein we analyze the behavior of these series with respect to exogenous,

policy-related variables in the economy. We use the stock of money and the government's total expenditure as loose proxies for monetary and fiscal policies. The point here is not whether these variables are sufficient statistics for the government's macro policies, which they are not, but instead that they are important variables in determining the operating environment of the production units in the economy. For two reasons, government expenditure is of particular interest in this context. Firstly, the state in India has, over the past three decades, reserved for itself the 'commanding heights' of the economy. The large public sector, therefore, plays a significant role in the aggregate economy, both directly and indirectly. Secondly, the notion of government expenditure points sharply at the heart of the distinction usually drawn between the formal and informal sectors. The informal sector here, and in general, is viewed as comprised of economic activities organized and transacted outside the penumbra of the state's shadow on the economy. If, however, the output of formal- and informal-sector firms is symmetric with respect to government expenditure, the relevance of the distinction is significantly eroded. Conversely, asymmetric behavior of the two series raises legitimate questions as to why such differences have existed for so long and leads to the important issue that the government's macroeconomic policies are neutral vis-à-vis a large fraction of the country's economy.

We use the idea of cointegrated time series, developed by Engle and Granger(1987), to formulate our tests. Cointegration is defined in the context of integrated variables where the latter refers to variables that are non-stationary in levels. Formally, a variable is integrated of order d, denoted I(d), if it has a stationary, invertible ARMA representation after

being differenced d times. Two variables are defined to be cointegrated of the order (d,b) if each variable is I(d) but at least one linear combination of these variables is I(d-b). For most applications the relevant situation is when d=b=1, implying that the variables are individually stationary only on first differencing but some linear combination of them is stationary in levels.

Since I(1) behavior is indicative of dominant long run components (the contribution of low frequencies), cointegration of two variables specifies a constraint on the long run components of the two series. The notion of cointegration, therefore, provides a natural way to test our hypotheses about the formal and informal-sector outputs. The output series represent aggregate behavior of firms that are operating in identical environment under the hypothesis that the formal-informal dichotomy is analytically vacuous. Under this hypothesis, the two series may differ at any time due to their being different aggregates, and thus subject to different sequences of innovations. However, their hypothesized homogeneity implies that they cannot drift apart "without limit" as would be implied by lack of cointegration.

The present analysis also has close links to the recent and rapidly expanding research into real business cycles which can be used to motivate more formally the tests undertaken here.[11] With 'business cycles' viewed as the joint time series behavior of economic variables, the motivation underlying real business cycle models is best summarized by Lucas(1977): "Though there is absolutely no need to anticipate it, one is led by the facts to conclude that, with respect to the qualitative behavior of comovements among series, business cycles are all alike"; the two major empirical

11. King et. al.(1988) for example has numerous references.

regularities used as stylized dynamic facts in this context are the persistence of the deviations of economic series from their trend and the comovement shown by measures of various economic activities.[12] These regularities consequently "suggest the possibility of a unified explanation of business cycles, grounded in the general laws governing market economies rather than in political or institutional characteristics specific to particular countries or periods", (Lucas(1977), our emphasis).[13] Since the distinction between formal and informal sectors is primarily one of institutional dualism, the real business cycle models may thus be seen to emphasize the null hypothesis guiding our tests, namely, 'there is no informal sector; if at all it exists, it is no different from the formal sector'.

Consider, for example, a simple real business cycle model with permanent productivity shocks,

$$Y_t = F(K_t, L_t) + \lambda_t \qquad (1)$$

where K and L are respectively the capital and labor inputs into a constant returns to scale technology F, and Y is the aggregate output. λ represents the shocks to total factor productivity, in the form of labor-augmenting technological progress that follows a random walk with a possibly non-zero drift μ; thus,

---

12. See Long and Plosser(1983) who also quote Lucas(1977).

13 This macroeconomic framework stands in stark contrast to the key implications of the microeconomic analysis of informal markets that institutions have a powerful impact on economic outcomes (see Bardhan (1989)).

$$\lambda_t = \mu + \lambda_{t-1} + \eta_t. \qquad (2)$$

The innovations η above are assumed iid with zero mean and constant, finite variance. The two equations imply that a common stochastic trend based on the productivity shocks will characterize the steady state behavior of output, consumption and investment in the economy. At the same time the short term dynamic behavior of these variables in response to trend shocks will vary depending upon the specific restrictions imposed on preferences and technology to ensure feasible steady states. With the constant returns to scale technology, the steady state is characterized by equal growth rates for all three variables given by the rate of growth of the labor augmenting technological progress.

We can use this general one-sector neoclassical model to formulate the hypothesis that there is no fundamental distinction between the formal and informal sector. In particular, consider a stochastic, stationary variable $\theta \in (0,1)$ and define the formal and informal sector outputs (YO and YU respectively) as

$$YO_t = \theta_t Y_t, \qquad (3a)$$

$$YU_t = (1-\theta_t) Y_t. \qquad (3b)$$

Equations (3a)-(3b) formalize the hypothesis that the distinction between formal and informal sector outputs is essentially arbitrary by formulating the outputs in the two sectors as stochastic drawings from the same underlying

data generating process.[14] Since θ is stationary, its effects are temporary and consequently the steady state behavior of YO and YU will be given by that of Y as in equation (1). The presumption that the dual sectors are formally identical means in this framework that the two sectors are subject to identical productivity shocks in the long run; the resulting common stochastic trend for the two output series implies cointegrated behavior.[15] Each variable can in this case be written as the sum of a trend, common to both, and stationary I(0) innovations that differ between the two. Thus, the hypothesized homogeneity of the two data generating processes is equivalent to the presence of a stochastic trend that is identical to both formal and informal-sector outputs along with asymmetric but stationary innovations.[16]

In addition to the reasons mentioned earlier, the inclusion of government expenditure into the analysis is particularly interesting for

---

14. The division of total output into formal and informal sector outputs can be formulated using more general ARMA representations for θ since the analysis is not affected as long as θ is stationary. Note also that implicit in this formulation is the notion that the informal sector is 'here to stay', i.e., is part of the steady-state equilibrium. The behavior of most ex-colonies in Asia and Africa provides little empirical evidence to support that the sector will vanish, so to speak. On the contrary, evidence suggests that the sector has in fact grown larger in economies subjected to structural adjustment in the eighties; see Toledo(1991).

15. Two I(1) variables have a common stochastic trend if they are cointegrated. More generally, if N I(1) variables have r cointegrating vectors, they will also possess N-r common stochastic trends. See Pagan and Wickens(1989) for a discussion and other references.

16. In contrast to this framework, one class of models of real business cycles is based upon multiple sectors with separate productivity trends each sector; see for example Long and Plosser(1983). However, the variables of interest in our analysis are output series that incorporate economic activities in all sectors of the economy. Consequently, given the maintained hypothesis driving the analysis we focus on the one-sector framework which seems to be more appropriate to the context.

another reason in the context of these theoretical considerations. In India, and indeed for most developing economies, the state plays an important role in the development process. The activities of the state include, inter alia, investments in infrastructure such as human and physical capital, facilitating and financing technology imports, pilot projects, etc., which have a direct bearing on productivity in the economy. It is quite plausible therefore that for developing economies in particular, productivity shocks are strongly correlated to government expenditure. The tests of common stochastic trends are then also intimately related to the question of to what extent have the government's development efforts had an economy-wide impact on economic productivity.[17]

III.2 Econometric methodology

A brief discussion of the econometric tests employed below for unit roots and cointegration might be useful at this stage. Regarding the former, it has now been established reasonably securely on the basis of Monte Carlo studies that the standard unit root tests are not very powerful against relevant alternatives such as trend stationarity (linear or non-linear), fractionally integrated processes and even level stationarity.[18] This is significant since the manner in which classical statistical hypothesis testing

---

17. Although monetary variables have little role to play in the framework of real business cycle theory, empirical evidence tends to suggest that nominal monetary innovations are important to fluctuations in economic activity over both short- and long-run, (King et. al.,(1991)).

18. See for example Phillips and Perron (1988), Schwert (1989), Dejong, Nankervis, Savin and Whiteman (1989) and Diebold and Rudebusch (1990).

is conducted results in the null hypothesis being accepted unless there is strong evidence against it; the null in case of the standard unit root tests is inevitably one of non-stationarity, i.e., a unit root. Although it is possible that the vast majority of aggregate economic time series do have a unit root, it is on the whole preferable if the above concern can also be addressed. This is especially relevant given the relatively smaller sample size available to us using annual data for India. Recent work by Kwiatkowski, Phillips and Schmidt(1991), henceforth KPS, is useful in the context of this problem. Since the KPS methodology may not be as well known as the other tests, we present a necessarily brief discussion below.

Using parameterization which provides a reasonable representation of both stationary and nonstationary variables, KPS have derived a test which has stationarity as the null hypothesis. The series under consideration, Y, is assumed to have the following decomposition:

$$Y_t = \xi t + \Gamma_t + \epsilon_t \qquad \text{where}$$

$$\Gamma_t = \Gamma_{t-1} + u_t \quad ; \quad u_t \sim iid(0, \sigma_u^2) \tag{4}$$

i.e., as the sum of a deterministic trend, a random walk and a stationary error; the initial value of Γ is treated as fixed and serves the role of an intercept. The null hypothesis of stationarity can be stated in two equivalent ways:

$$\text{(a)} \quad \sigma_u^2 = 0, \text{ or, } \quad \text{(b)} \quad \sigma_\Gamma^2 = 0.$$

The innovations ϵ_t being stationary, Y_t is also stationary under the null hypothesis and the test statistic is thus based on the estimated residuals. The distribution of the test statistic is derived under assumptions about the residuals, e_t, that allow for many weakly dependent and heterogeneously distributed time series, including a wide class of data generating mechanisms

such as finite order ARMA models, under very general conditions. Specifically, it is assumed that $(e_t)^{\infty}_{o}$ is a sequence of innovations that satisfy the following conditions (see Phillips and Perron (1988)):

$E(e_t) = 0$, for all t;

$E \|e_t\|^{\beta+\epsilon} < 0$ for some $\beta > 2$ and $\epsilon < 0$;

$\sigma_2 = \lim E(T^{-1}S^2_T)$ exists as $T \rightarrow \infty$, where $S_t = e_1+\ldots+e_t$; and,

$(e_t)^{\infty}_{o}$ is strong mixing with mixing coefficients α_m that satisfy $\sum^{\infty}\alpha_m^{1-2/\beta} < \infty$.

Under these assumptions the test statistic for testing trend stationarity is derived from the residuals of a regression of Y_t on intercept and trend and takes the form:

$$\hat{\eta}_T = T^{-2} \sum_{t=1}^{T} S_t^2 \; / \; s^2(k)$$

$$\text{where } s^2(k) = T^{-1} \sum_{t=1}^{T} e_t^2 + 2T^{-1} \sum_{s=1}^{k} (1-s/(k+1)) \sum_{t=s+k}^{T} e_t \, e_{t-s} \, ,$$

S is the partial sum process of the regression residuals, e_t, and $(1- s/(k+1))$ is an optional Bartlett spectral window to allow for residual correlations. To test for level stationarity instead of trend stationarity, ξ in (4) is set equal to zero and the residuals are from a regression of Y on only the intercept. This statistic is denoted by $\hat{\eta}_{\mu}$. KPS have also provided critical values for tests of both level and trend stationarity.

In this paper we test for both the null hypothesis of a unit root and the null hypothesis of stationarity. This means we have four possible outcomes:

(i) If the null of stationarity is accepted but that of a unit root is rejected we can conclude that a series is stationary;

(ii) If the null of stationarity is rejected and that of a unit root cannot be rejected then the series is non-stationary;

(iii) If both the nulls are accepted then we cannot be sure whether or not there is stationarity;

(iv) If both nulls are rejected then we cannot reach any conclusion.

It is obvious that (iii) and (iv) can be problematic as to what to make out of the series under consideration; (i) and (ii) are clear-cut.

With respect to testing for cointegration, a number of tests exist that are based upon the OLS residuals of the cointegrating regression, including the Cointegrating Regression Durbin Watson test and the DF/ADF tests.[19] Following Engle and Granger(1987), who report Monte Carlo results documenting the superior performance of residuals-based ADF tests, we have chosen to use the same for the cointegration tests below. It is worth noting that the superior performance of ADF in Engle and Granger(1987) was despite their having to utilize approximate critical values which have since then been refined. Again the null hypothesis, for this and other tests of co-integration, is that of no cointegration (unit root in the residuals). Given the rationale above for having the null of stationarity when testing for unit roots, we have in a few cases also adapted the KPS methodology in our tests for cointegration. This is done by using the residuals from a co-integrating equation between two variables of interest in the KPS test statistic, $\hat{\eta}_{\mu}$. The null hypothesis to be tested is now the converse to that

19. Johansen(1988) provides another test for multivariate systems. See Pagan and Wickens(1989) for other tests.

of previous tests that have been used to check for cointegration. However, for various reasons we have used the KPS statistic only sparingly in our investigation of co-integrating relationships. More specifically, the KPS statistic is deployed only when there is a concern that the likelihood of low power associated with ADF leads to the wholesale acceptance of the null. Our concern with using KPS statistic for cointegrating residuals is threefold. Firstly, since the residuals are estimated series and not directly observable, the appropriate critical values are strictly not the ones available from tables for unit root tests. Secondly, our own rather limited investigation led us to conclude that the value of the KPS statistic can be quite sensitive to the length of the Bartlett lag windows used in correcting for residual correlations. Thirdly, unlike the ADF test, there have been no Monte Carlo investigations to determine the power of the KPS test statistic.

Finally, in a further effort to ensure that the results obtained are robust, different specifications were tried in the estimation of the cointegrating relationships. In particular, the relationships of the variables were investigated in real and nominal terms using both demeaned data as well as data that were demeaned and detrended. The specifications are detailed in section VI below. The price deflator used is the wholesale price index with 1970–71 as the base year.

IV Estimates of order of integration of individual series

For expositional purposes, we summarize the various results of sections IV–VI in tables that supplement the text. The actual estimates for the corresponding tests are reported in detail in the Appendix.

The estimated results of tests for unit roots are summarized in Table 1 (the actual estimates are in Tables A.1-A.6 in the appendix).

IV.1 Total output (Y) and total non-agricultural output (YNA):

At the aggregate level, investigating the unit root properties of the two series Y and YNA in real terms using the KPS methodology we find that for both nulls (i.e., that of trend stationarity and that of level stationarity) the two series are I(1). For the nominal series we find that both series exhibit I(2) behavior. The findings from the KPS procedure were in complete congruence to those that were obtained using the ADF methodology (i.e. for both level and trend stationarity, the two series in real terms are I(1) and in nominal terms they are I(2)).

IV.2 Disaggregated ouputs and the fiscal and monetary variables:

Unit roots were investigated for a further nine variables: total organized sector output (YO), total unorganized sector output (YU), total non-agricultural organized sector output (YONA), total non-agricultural unorganized sector output (YUNA), total manufacturing organized sector output (YOMAN), total manufacturing unorganized sector output (YUMAN), currency with public (CU) and a broad monetary aggregate (M1). While the behavior of these variables was investigated in both nominal and real terms, it did not make much sense to test for the unit-root properties of nominal government expenditure which was consequently analyzed only in real terms (GE).

Testing for trend stationarity using the KPS statistic, we found that at the 5% level of significance the null of stationarity was rejected for levels for all eight nominal variables. After first differencing the null of

stationarity was still rejected at the 5% level for all the series except for total unorganized sector output; at the 10% level, however, the null was rejected for all eight series in nominal terms. Further, the null of stationarity after second differencing the eight nominal series could not be rejected. Using the ADF methodology the null of the existence of a unit root could not be rejected for both levels and first differences of all eight variables of interest at the 5% level. After second differencing the series the null of unit root could not be accepted.

Checking for level stationarity using the KPS procedure it was found that, at 5% level of significance, the null of stationarity was rejected for both levels and first differences for all eight nominal series. After second differencing the null of stationarity was accepted for all the series. The ADF testing procedure gave identical results when a time trend was not used. In summary, therefore, the behavior of the various series in nominal terms is the same using both the ADF and the KPS procedures: both in terms of level and trend stationarity, the nominal series are integrated to the same order and are I(2).

Focusing on the behavior of the series in real terms, unit root tests using the KPS methodology for investigating trend stationarity show that the null of stationarity was rejected for the above eight variables and real government expenditure in level terms. However, after first differencing, the null of trend stationarity could not be rejected at the 5% level of significance. The same conclusions were reached with respect to the ADF procedure.

Using the KPS statistic for level stationarity, once again the null of stationarity is rejected for all the nine series in terms of real levels.

Further, the null of stationarity after first differencing could not be rejected for YO, YU, YONA, YUNA, YUMAN and CU. However, the same null was rejected for YOMAN, M1 and government expenditure (GE). Similarly, using the ADF statistic to look at the behavior of the nine variables showed that, without a time trend, the null of unit root could not be rejected for any of the nine series. After first differencing, the series YO, YU, YONA, YUNA, YUMAN and GE are stationary while the null of unit root in first differences could not be rejected for YOMAN, CU and M1. The latter three variables turned out to be I(2) with respect to the ADF procedure.

The main conclusion that is reached after conducting the above comprehensive menu of tests is that for the most part both the KPS and ADF procedures give us identical results for the behavior of the nine series. In nominal terms the series are trend stationary as well as level stationary after second differencing; all the series are thus integrated to order two. In real terms, on the other hand, the results for level stationarity are indicative of I(1) behavior for most of the series except YOMAN which seems to be I(2) while the behavior of GE and M1 is unclear with the KPS and the ADF tests yielding results inconsistent with each other. In contrast, the results are quite clear cut when the variables are tested for trend stationarity: no matter which way the test is set up (null of stationarity or null of unit root) it is found that in real terms all nine variables are integrated to the first order (I(1)) and are thus trend stationary upon first differencing.

V Relationships among inter- and intra-sectoral outputs

V.1 Intra-sectoral relationships:

If one arbitrarily slices a particular series into two or more components of adequate aggregation, there is no a priori reason to expect these components to behave differently vis-à-vis the whole aggregate. To provide an example of this hypothesis we conducted cointegration tests, using demeaned data, between total organized output and each of its two components namely, total organized sector non-agricultural output and total organized sector manufacturing output; see Tables 2A and 2B. In both cases the null of no cointegration was rejected at 1% level of significance, strongly implying cointegrated behavior of the series. Similarly, we investigated the relationship between total organized sector non-agricultural output and one of its components, namely, the formal sector manufacturing output. Again, the null of no cointegration had to be rejected strongly at 1% significance level. These sets of results indicate that the formal sector in India exhibits a certain homogeneity at least as evidenced by the co-movements of its components. This could be as a result of several factors that commonly affect the constituent parts of the formal sector. These would include such institutional factors like a common legal framework, in addition to government policy variables; alternatively, this can be interpreted as usual business cycle attributes due to the presence of common productivity shocks.

In stark contrast, however, conducting identical analyses for the informal sector shows that (i) total informal sector output is not cointegrated with informal sector non-agricultural output and informal sector manufacturing output; (ii) the total non-agricultural component of the unorganized sector is not cointegrated with the informal sector manufacturing

output. These diametrically opposite sets of results compared to that for the organized sector suggests that the informal sector has few underlying factors that "bind" the various components. In other words, it is less homogeneous than the organized sector.[20]

V.2 Inter-sector relationships:

Before we embark on determining what economic variables influence organized and unorganized sector outputs at various levels of aggregation, it may also be instructive to determine whether there is evidence of a strong relationship between the two sectors at different levels of aggregation. It is obvious that one would be interested in looking at these relationships for the real magnitudes of the various outputs, rather than the nominal magnitudes. The reason why these inter-sector relationships are important to analyze is as follows. If we find that there is no relationship between the outputs of the formal and informal sectors, then this provides us with initial evidence to expect that there are different data generation processes and/or economic policy variables that drive the outputs of these two sectors.

Using the ADF methodology, the following cointegrating regressions were estimated:

$$\text{Real YO}_t = \alpha_1 + \beta_1 t + \text{Real YU}_t + U_{1t}$$

$$\text{Real YONA}_t = \alpha_2 + \beta_2 t + \text{Real YUNA} + U_{2t}$$

20. These results are thus suggestive that there is no 'one' informal sector which, instead, can be viewed as disparate, heterogeneous sets of economic activity surrounding a homogeneous core. However, considerable more testing is entailed in exploring this idea more formally. See also footnote 4 above.

$$\text{Real YOMAN}_t = \alpha_3 + \beta_3 t + \text{Real YUMAN}_t + U_{3t}$$

where α is a constant and t is the time trend. The results are presented in Table 3 (and Table A.10). For all three the null of no cointegration could not be rejected at even 10% level of significance. As a check for robustness, the three equations were re-estimated with only demeaned data and again the null of no cointegration could not be rejected. Both sets of tests indicated very strongly the hypothesis that the formal- and informal-sector outputs are not cointegrated, across different levels of (dis)aggregation.

VI Cointegration between outputs and fiscal and monetary variables

Turning to the comovement between government policies and output at various levels of aggregation, we present estimated results for all eight output series.[21] Since detrending is appropriate when the series have a non-zero drift we first estimate, for each of the eight series, a general cointegrating relationship between a monetary aggregate and output of the following form.

$$Y_i = \mu + \beta t + \gamma \left(\frac{M_j}{P}\right) \qquad (5)$$

where M_j is either M1 or currency (CU) held by the public, μ is a constant, Y_i is the real output series under consideration and t the time trend. In

[21] In developing economies where monetary expansion is often used as a residual revenue source for financing government expenditures there is an inextricable link between fiscal and monetary variables. Cointegration tests conducted by us to investigate this were supportive of this view. See Buiter and Patel(1991) for both a formal analysis of this relationship and its application to the public finances of India.

addition, the relationship in (5) was also estimated using in place of monetary variables the total real government expenditure in India (GE). The results are presented in Table 4.

In order to assess the robustness of the results obtained from the estimation of equation (5), we also estimated alternative plausible specifications. Consequently, (5) was re-estimated using demeaned data alone as well as with nominal variables instead of real (except for GE). These results are reported in Tables 5 and 6.

VI.1 Total output (Y) and total non-agricultural output (YNA):

The results in Table 4 suggest that, at the aggregate level, there is no cointegration between output and the policy variables. The null hypothesis of no cointegration cannot be rejected for total output with respect to any of the policy variables. A glance at the other two tables shows these results are robust to alternative specifications. The total non-agricultural output also shows similar results with respect to the monetary variables. However, the null of no cointegration between the non-agricultural output and real government expenditure is rejected at 10% level of significance. In sum, hence, evidence in support of cointegration with the policy variables is non-existent for total output and at best tenuous with respect to total non-agricultural output.

VI.2 Sectoral ouputs and fiscal and monetary variables, GE, M1 and CU

Given our motivation for analyzing the relative behavioral differences between formal and informal sector output we look at the co-movement between each of the six relatively disaggregated output series and three monetary and

fiscal control variables of the government viz. currency held by the public, M1 and the total government expenditure of the central government, state governments and union territories. Since the cointegration of money with output is usually predicated upon the quantity theory of money and a constant (or at least stationary) velocity, we would not necessarily expect an identical relationship with respect to disaggregated outputs. The greater the level of disaggregation, the less likelihood there exists of seeing a well identifiable relationship with aggregate monetary variables. However, the issue of interest for present purposes is not whether the disaggregated output series are cointegrated with the aggregate policy variables, but is instead: are there systematic patterns in the observed relationships of these variables that belie the hypothesized homogeneity of the formal and informal sectors?

As indicated in Table 4, the answer to this question on the whole seems positively affirmative. In general it is found that the null hypothesis of no cointegration between the policy variables and the disaggregated outputs is rejected for all the formal-sector outputs and cannot be rejected for any of the informal-sector output series. The only exception is that of manufacturing output in the formal sector with respect to the aggregate money stock. These results are strongest with respect to the real government expenditure (GE) and M1, where they hold for 5% level of significance. where as for currency the level of significance (for rejecting the null of no cointegration) is 10%.

The cointegration between government expenditure and formal-sector outputs, and lack of it with respect to informal-sector outputs, is also unaffected by using the alternative specification for the cointegrating regression. As Table 5 shows, the systematic pattern is replicated for

government expenditure. This is a rather surprising but important result, whether government expenditure is viewed as a proxy for productivity shocks in a developing-country context, or more broadly in terms of the 'commanding heights' role of the state.

The relationship between M1 and CU to the output series shows the same systematic pattern when formulated in nominal rather than real terms (Table 6). When the cointegrating regressions are re-estimated using non-detrended, demeaned data, the systematic pattern is still similar but somewhat weaker. In nominal terms, the null hypothesis of no cointegration with respect to currency is rejected only with formal-sector outputs YO and YONA while lack of cointegration with M1 cannot be rejected for any series except YONA (Table 6). The same specification but in real terms leads to en masse acceptance (lack of rejection) of the null of no cointegration with respect to M1 and currency; Table 5A. Indeed, the results in Table 5A are the only results obtained that are consistent with our null hypothesis of homogeneous formal and informal sectors. In light of the en masse acceptance of the null of no cointegration, these cointegrating regressions were re-estimated using the KPS methodology with the results presented in Table 5B. The null hypothesis, now of cointegration, was rejected for all series with respect to currency. However, with respect to M1, we again find the same systematic pattern. The null hypothesis of cointegration was rejected for all informal-sector outputs but could not be rejected for any of the output series of the formal sector.

VII Concluding remarks

Using as its premise the commonly held notion that the distinction between formal and informal sectors is essentially vacuous, this paper has

analyzed the aggregate behavior of economic activity in the two sectors as measured by output. The results in the paper lead us to reject our null hypothesis; contrary to the hypothesis, the behavior of the two output series is markedly different. The formal-sector output is seen to be homogeneous, with its various components sharing the same stochastic trend, or productivity shocks. It is also cointegrated with the policy variables - currency, M1 and real government expenditure. In sum, the time-series behavior of the formal sector output conforms well to the predictive and explanatory scope of theory. The informal-sector output, in contrast, is far from "well behaved".

The analysis presented here raises a number of important questions, both theoretical and policy related. For example, while much of the literature on real business cycles is driven by certain regularities of the ratios amongst economic series, such as consumption to income or investment to income, we have looked here closely at some basic indices of economic activity relating to essentially one series, namely, output. A fundamental question raised in this process is what does 'business cycle' mean in the context of dual economies which most ex-colonies still are?; the lack of homogeneity of the informal sector implies that perhaps a more accurate description in this context is 'fragmented economies'. Related to questioning the relevance of these models to fragmented economies, our analysis also leads to scepticism towards the assumption that institutional details are irrelevant to explaining aggregate economic activity.

The analysis also has important implications specifically in the context of economic development. The size of the informal sector in India, although large, is still smaller in relative terms than in many other economies, particularly in Africa; the large industrialized, formal sector in India often

has no counterpart in these economies. The results presented here indicate that there is a large part of the economy that seems to be devoid of any significant long-term relationships with either the rest of the generating economy or the government and its policies. Furthermore, this sector is virtually ignored; no systematic data are collected to monitor these activities, nor are measurements of these activities (nor corresponding theoretical concepts) incorporated in analyzing the behavior of these economies and the impact of various policies. It is hoped that the analysis presented here will draw attention to these serious lacunae in understanding the process of economic development.

REFERENCES

Bardhan, P., ed., 1989, The Economic Theory of Agrarian Institutions, Oxford: Clarendon.

Boeke, J.H., 1953, Economics and Economic Policy of Dual Societies as exemplified by Indonesia, New York: International Secretariat of Pacific Relations.

Buffie, E., 1984, Financial Repression, the New Structuralists, and Stabilization Policy in Semi-industrialized Economies, Journal of Development Economics, 14.

Buiter, W.H., and U.R. Patel, 1991, Debt, Deficits and Inflation: An Application to the Public Finances of India, Revised Version: Forthcoming in Journal of Public Economics. (First Version: January 1990).

Dejong, D.N., J.C. Nankervis, N.E. Savin and C.H. Whiteman, 1989, Integration Versus Trend-Stationarity in Macroeconomic Time Series, Working Paper No. 89-31, Department of Economics, University of Iowa, December.

Diebold, F.X., and G.D. Rudebusch, 1990, On the Power of Dickey-Fuller Tests Against Fractional Alternatives, Finance and Economics Discussion Series Paper No. 119, Board of Governors of the Federal Reserve System.

Elkan, W., 1959, Criteria for Industrial Development in Uganda, East African Economic Review, 5, 2.

Engle, R.F., and C.W.J. Granger, 1987, Cointegration and Error Correction: Representation, Estimation and Testing, Econometrica, 55, pp 251-76.

International Labor Office, 1972, Employment, Incomes and Equality: A Strategy for Increasing Productive Employment in Kenya, ILO, Geneva.

Johansen, S., 1988, Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, 12, pp. 231-54.

King, R.G., Plosser, C.I., Stock, J.H. and M.W. Watson, 1991, Stochastic Trends and Economic Fluctuations, American Economic Review, 81, 4, pp. 819-40.

King, R.G., C.I. Plosser and S. Rebelo, 1988, Production, Growth and Business Cycles: The Basic Neoclassical Model, Journal of Monetary Economics, 21, pp. 195-232.

Koopmans, T.C., 1947, Measurement Without Theory, The Review of Economics and Statistics, 27, pp.161-172.

Kwiatkowski, D., P.C.B. Phillips and P. Schmidt, 1991, Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root: How Sure are we that Economic Time Series have a Unit Root?, Mimeograph.

Lewis, W. A., 1954, Economic Development with Unlimited Supplies of Labor, Manchester School, 22, pp. 139-91.

Long, J.B., and C.I. Plosser, 1983, Real Business Cycles, Journal of Political Economy, 91, 1, pp. 39-69.

Lucas, R.E., Jr., 1977, Understanding Business Cycles, in Brunner, K., and A. Meltzer, eds., Stabilization of the Domestic and International Economy, Carnegie-Rochester Conference Series on Public Policy, 5, Amsterdam, North Holland.

Pagan, A.R., and M.R. Wickens, 1989, A Survey of Some Recent Econometric Methods, The Economic Journal, 99, pp. 962-1025.

Peattie, L., 1987, An Idea in Good Currency and How it Grew: The Informal Sector, World Development, 15, 7, pp. 851-60.

Phillips, P.C.B., and P. Perron, 1988, Testing for a Unit Root in Time Series Regression, 75, 2, pp. 335-346.

Ranis, G., and J.C.H. Fei, 1982, Lewis and the Classicists, in Gersovitz, M., Diaz-Alejandro, C., Ranis, G. and M. Rosenzweig (eds.), The Theory and Experience of Economic Development, George Allen and Unwin, London.

Schwert, G.W., 1989, Tests for Unit Roots: A Monte Carlo Investigation, Journal of Business and Economic Statistics, 7,2, pp. 147-159.

Srivastava, P., 1990, Informal Credit Markets and Financial Underdevelopment: Evidence from Money Demand in India, Development Discussion Paper No. 338, HIID, Harvard University.

Toledo, A., ed., 1991, La Sociedad Informal: Una Vision Multidisciplinaria, ESAN/IDE, Lima, Peru, (forthcoming).

van Wijnbergen, S., 1983, Credit Policy, Inflation and Growth in a Financially Repressed Economy, Journal of Development Economics,13.

TABLE 1: KPS unit root tests

Real Variables: Trend Stationarity	Levels	1st Difference
Y	R	A; I(1)
YNA	R	A; I(1)
YO	R	A; I(1)
YU	R	A; I(1)
YONA	R	A; I(1)
YUNA	R	A; I(1)
YOMAN	R	A; I(1)
YUMAN	R	A; I(1)
CU	R	A; I(1)
M1	R	A; I(1)
GE	R	A; I(1)

Real Variables: Level Stationarity	Levels	1st Difference	2nd Difference
Y	R	A; I(1)	
YNA	R	A; I(1)	
YO	R	A; I(1)	
YU	R	A; I(1)	
YONA	R	A; I(1)	
YUNA	R	A; I(1)	
YOMAN	R	R	I(2)
YUMAN	R	A; I(1)	
CU	R	A; I(1)	
M1	R	R	I(2)
GE	R	R	I(2)

Note: Null: Stationarity; R: Reject null; A: Not reject null.

TABLE 1 cont'd.: KPS unit root tests

Nominal Variables: Trend Stationarity	Levels	1st Difference	2nd Difference
Y	R	R	A; I(2)
YNA	R	R	A; I(2)
YO	R	R	A; I(2)
YU	R	R	A; I(2)
YONA	R	R	A; I(2)
YUNA	R	R	A; I(2)
YOMAN	R	R	A; I(2)
YUMAN	R	R	A; I(2)
CU	R	R	A; I(2)
M1	R	R	A; I(2)

Nominal Variables: Level Stationarity	Levels	1st Difference	2nd Difference
Y	R	R	A; I(2)
YNA	R	R	A; I(2)
YO	R	R	A; I(2)
YU	R	R	A; I(2)
YONA	R	R	A; I(2)
YUNA	R	R	A; I(2)
YOMAN	R	R	A; I(2)
YUMAN	R	R	A; I(2)
CU	R	R	A; I(2)
M1	R	R	A; I(2)

Note: Null: Stationarity; R: Reject null; A: Not reject null.

TABLE 2A: Intra-sectoral Cointegration Tests: Formal Sector

	YONA	YOMAN
YO	C	C
YONA		C

TABLE 2B: Intra-sectoral Cointegration Tests: Informal Sector

	YUNA	YUMAN
YU	NC	NC
YUNA		NC

TABLE 3: Inter-sectoral Cointegration Tests

Demeaned, detrended

	YU	YUNA	YUMAN
YO	NC		
YONA		NC	
YOMAN			NC

Demeaned

	YU	YUNA	YUMAN
YO	NC		
YONA		NC	
YOMAN			NC

Note: C: Cointegrated; NC: Not cointegrated.

TABLE 4: Cointegration Between Output Series and Policy Variables (ADF)

Real, demeaned, detrended	CU	M1	GE
Y	NC	NC	NC
YNA	NC	NC	C[1]
YO	C[1]	C	C
YU	NC	NC	NC
YONA	C[1]	C	C
YUNA	NC	NC	NC
YOMAN	C[1]	NC	C
YUMAN	NC	NC	NC

[1] At 10% level of significance

TABLE 5A: Cointegration Between Output Series and Policy Variables (ADF)

Real, demeaned	CU	M1	GE
Y	NC	NC	NC
YNA	C	C	C[1]
YO	NC	NC	C
YU	NC	NC	NC
YONA	NC	NC	C
YUNA	NC	NC	NC
YOMAN	NC	NC	C[1]
YUMAN	NC	NC	NC

[1] At 10% level of significance

TABLE 5B: Cointegration Between Output Series and CU and M1 (KPS)

Real, demeaned	CU	M1
YO	NC	C
YU	NC	NC
YONA	NC	C
YUNA	NC	NC
YOMAN	NC	C
YUMAN	NC	NC

TABLE 6: Cointegration Between Output Series and Policy Variables (ADF)

Nominal Demeaned, detrended	CU	M1
Y	NC	NC
YNA	NC	NC
YO	C	C
YU	NC	NC
YONA	C	C
YUNA	NC	NC
YOMAN	NC	C
YUMAN	NC	NC

Nominal, demeaned	CU	M1
Y	NC	NC
YNA	NC	NC
YO	C	NC
YU	NC	NC
YONA	C	C
YUNA	NC	NC
YOMAN	NC	NC
YUMAN	NC	NC

APPENDIX

We present below more detailed tables for the results summarized in the text of the paper. The notation used is as follows:

YO = Total Organized Sector Output
YU = Total Unorganized Sector Output
YONA= Total Non-Agricultural Organized Sector Output
YUNA= Total Non-Agricultural Unorganized Sector Output
YOMAN=Total Manufactured Organized Sector Output
YUMAN=Total Manufactured Unorganized Sector Output

Table A.1: Test of unit roots, real variables, levels: ADF

	Level stationarity	Trend stationarity
Y	0.48	-2.58
	(.99)	(.29)
YNA	1.29	-0.20
	(.99)	(.99)
YO	2.00	-0.12
	(.99)	(.98)
YU	-0.33	-2.97
	(.93)	(.16)
YONA	2.03	-0.08
	(.99)	(.98)
YUNA	1.37	-0.67
	(.99)	(.95)
YOMAN	1.46	-0.71
	(.99)	(.95)
YUMAN	1.18	-1.95
	(.99)	(.61)
M1	1.94	-0.32
	(.99)	(.98)
CU	1.25	-0.65
	(.99)	(.96)
GE	2.31	0.35
	(.99)	(.99)

Lower tail area is in parantheses

Table A.2: Test for unit roots, real variables, first difference: ADF

	Level stationarity	Trend stationarity
Y	-3.54	-3.66
	(.02)	(.05)
YNA	-3.15	-4.05
	(.04)	(.02)
YO	-3.24	-4.12
	(.03)	(.02)
YU	-3.38	-4.51
	(.02)	(.01)
YONA	-3.28	-4.17
	(.03)	(.02)
YUNA	-3.02	-3.76
	(.05)	(.04)
YOMAN	-2.76	-3.86
	(.08)	(.03)
YUMAN	-3.55	-4.30
	(.01)	(.01)
M1	-2.28	-3.69
	(.19)	(.04)
CU	-2.72	-3.64
	(.08)	(.04)
GE	-3.63	-3.78
	(.01)	(.03)

Table A.3: Test for unit roots, real outputs: KPS

	Trend stationarity		Level stationarity	
Variable	Level	Differenced	Level	Differenced
Y	0.138	0.062	1.265	0.143
YNA	0.269	0.059	1.246	0.344
YO	0.262	0.063	1.224	0.319
YU	0.080	0.051	1.247	0.054
YONA	0.262	0.063	1.223	0.319
YUNA	0.270	0.051	1.270	0.350
YOMAN	0.310	0.073	1.331	0.494
YUMAN	0.248	0.046	1.419	0.278

The 95% critical values for KPS tests are 0.146 and 0.463 for trend and level stationarity respectively.

Table A.4: Test for unit roots, nominal outputs: KPS

	Trend stationarity		Level stationarity	
Variable	Level	Differenced	Level	Differenced
Y	0.303	0.182	1.190	0.973
YNA	0.313	0.259	1.159	1.085
YO	0.308	0.260	1.143	1.058
YU	0.296	0.108	1.214	0.819
YONA	0.308	0.259	1.142	1.056
YUNA	0.318	0.213	1.177	1.084
YOMAN	0.343	0.296	1.240	1.214
YUMAN	0.358	0.189	1.329	1.211

Table A.5: Test for unit roots, real monetary and fiscal variables: KPS

	Trend stationarity		Level stationarity	
Variable	Level	Differenced	Level	Differenced
CU	0.291	0.075	1.131	0.427
M1	0.331	0.074	1.241	0.683
GE	0.324	0.105	1.310	0.638

Table A.6: Test for unit roots, nominal monetary variables: KPS

	Trend stationarity		Level stationarity	
Variable	Level	Differenced	Level	Differenced
CU	0.344	0.292	1.252	1.180
M1	0.345	0.330	1.223	1.220

Table A.7: Cointegration tests: total outputs(Y,YNA) and policy variables

Real variables

	Demeaned			Demeaned, detrended		
Variables	CU	M1	GE	CU	M1	GE
Y	-2.30	-1.98	-2.12	-3.65	-3.41	-3.63
	(.41)	(.57)	(.50)	(.13)	(.19)	(.14)
YNA	-3.29	-4.20	-3.45	-2.69	-3.92	-3.88
	(.09)	(.01)	(.07)	(.48)	(.08)	(.09)

Nominal Variables

	Demeaned		Demeaned, detrended	
Variables	CU	M1	CU	M1
Y	-2.49	-1.34	-3.61	-3.15
	(.32)	(.82)	(.14)	(.28)
YNA	-4.24	-2.00	-4.20	-3.54
	(.01)	(.56)	(.05)	(.16)

Table A.8: Cointegration tests: all non-total outputs and monetary variables

Real variables

	Demeaned		Demeaned, detrended	
Variables	CU	M1	CU	M1
YO	-2.82	-2.59	-3.33	-4.09
	(.20)	(.28)	(.08)	(.02)
YU	-2.11	-2.04	-3.05	-3.14
	(.50)	(.54)	(.14)	(.12)
YONA	-2.83	-2.62	-3.31	-4.12
	(.20)	(.27)	(.09)	(.02)
YUNA	-2.44	-1.80	-3.04	-2.95
	(.35)	(.65)	(.14)	(.16)
YOMAN	-2.34	-2.24	-3.21	-2.75
	(.39)	(.44)	(.10)	(.22)
YUMAN	-1.44	-1.26	-2.49	-2.45
	(.80)	(.85)	(.32)	(.34)

Nominal Variables

	Demeaned		Demeaned, detrended	
Variables	CU	M1	CU	M1
YO	-4.36	-3.48	-4.58	-4.85
	(.01)	(.06)	(.02)	(.01)
YU	-1.83	-1.37	-3.47	-3.61
	(.63)	(.81)	(.18)	(.14)
YONA	-4.30	-3.58	-4.54	-4.99
	(.01)	(.05)	(.03)	(.01)
YUNA	-3.27	-1.36	-3.64	-2.63
	(.09)	(.82)	(.13)	(.50)
YOMAN	-3.41	-2.21	-3.43	-4.82
	(.07)	(.46)	(0.18)	(.01)
YUMAN	-1.32	-1.14	-2.45	-2.01
	(.84)	(.88)	(.60)	(.77)

Table A.9: Cointegration tests: real outputs and government expenditures

Variables	Demeaned	Demeaned, detrended
YO	-4.06 (.02)	-4.62 (.01)
YU	-2.08 (.52)	-3.24 (.10)
YONA	-3.98 (.02)	-4.45 (.01)
YUNA	-1.72 (.68)	-3.14 (.12)
YOMAN	-3.52 (.06)	-4.07 (.02)
YUMAN	-1.71 (.70)	-2.87 (.18)

Table A.10: Cointegration tests: inter-sectoral outputs

Real variables

Variables	Demeaned	Demeaned, detrended
YO-YU	-2.14 (.49)	-3.13 (.12)
YONA-YUNA	-2.11 (.50)	-3.07 (.13)
YOMAN-YUMAN	-2.23 (.45)	-3.01 (.14)

Table A.11: Cointegration tests: intra-sectoral outputs

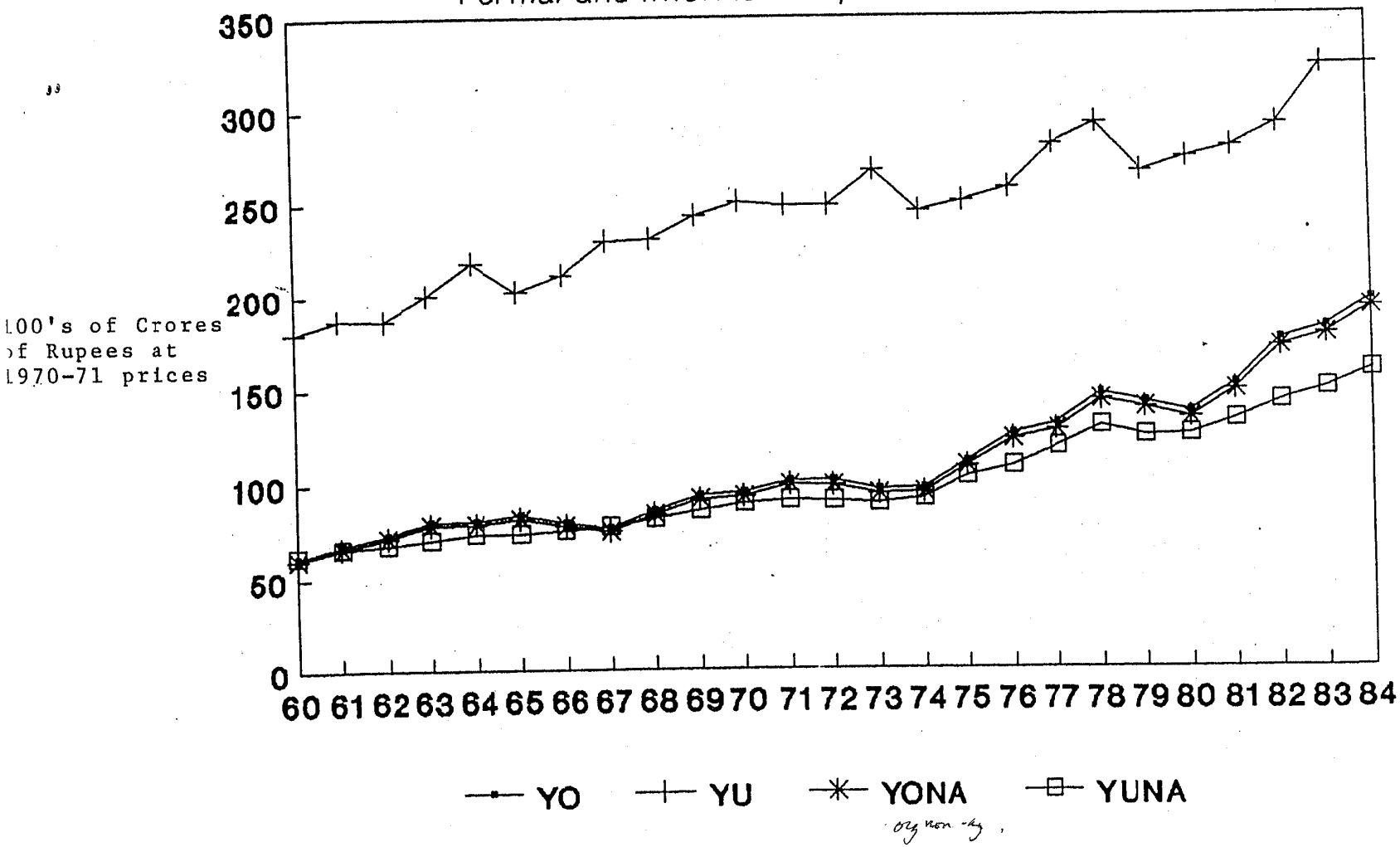
Real variables

A.		YONA	YOMAN
	YO	-4.86 (.00)	-4.70 (.01)
	YONA	-	-4.69 (.01)

B.		YUNA	YUMAN
	YU	-2.28 (.42)	-2.06 (.53)
	YUNA	-	-2.01 (.55)

FIGURE 1

Formal and Informal Outputs In India:1960-84

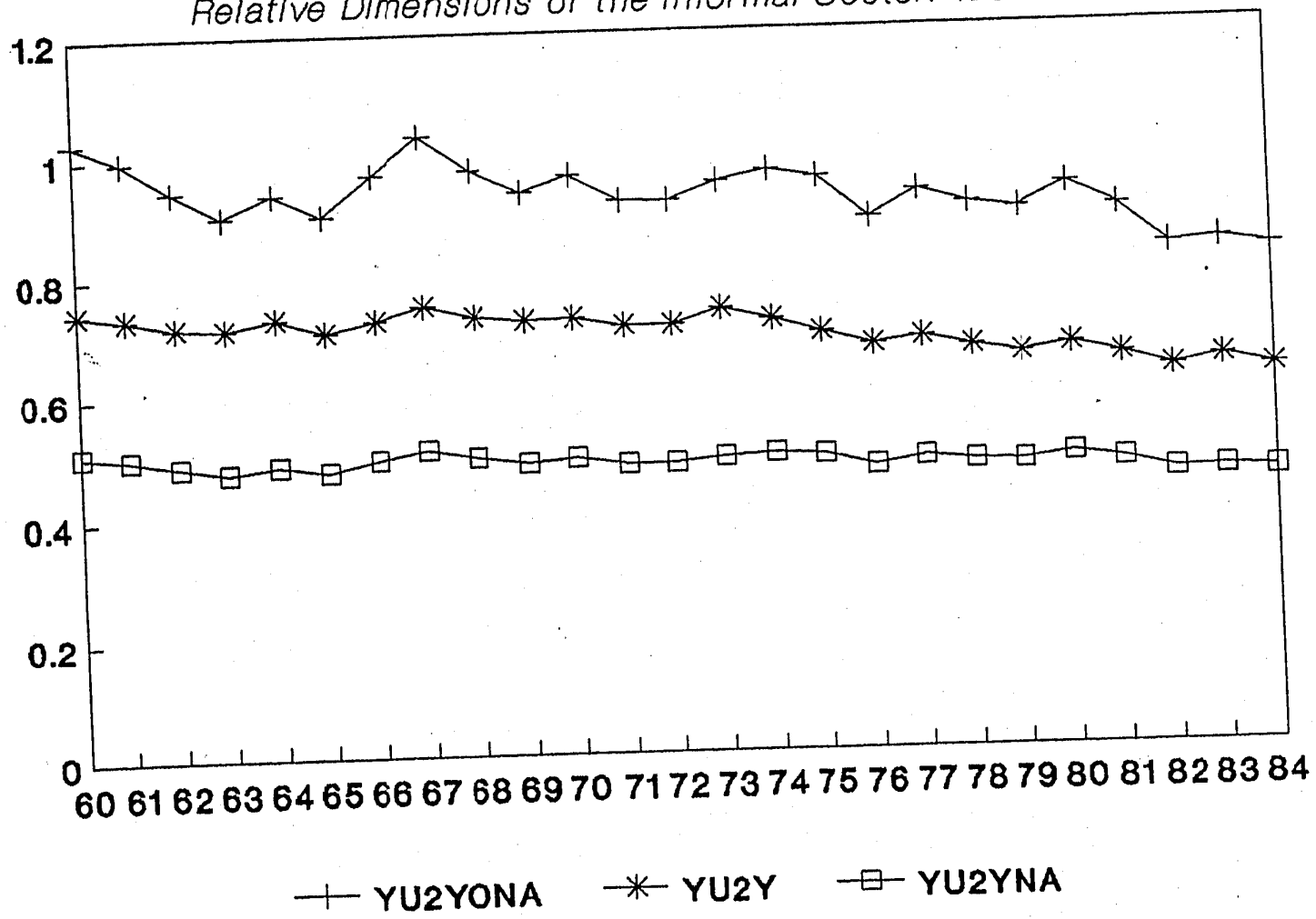


100's of Crores of Rupees at 1970-71 prices

Note: 1 Crore = 10 Million

FIGURE 2

Relative Dimensions of the Informal Sector: 1960-84



YU2Y(NA)-YU(NA)/Y(NA), YU2YONA-YUNA/YONA